EFFECT OF AEROBIC EXERCISES ON BLOOD PRESSURE IN MILD AND MODERATE HYPERTENSIVE MIDDLE AGED AND OLDER PATIENTS.

[1*]Abu Shaphe, [2]Irshad Ahmad, [3]Faizan Z Kashoo, [4]Shadabuddin

ABSTRACT

Background: *The prevention and treatment of hypertension are a high priority in medicine and public health. It is well documented that blood pressure reduction with medication significantly reduces cardiovascular risk. Exercise remains a cornerstone therapy for the primary prevention, treatment, and control of hypertension. This study aims at analysing the effect of Aerobic exercises on reduction of Blood Pressure in the subject with Pre and Stage 1 hypertension.* ***Material and Methods:*** *In this study patient with pre hypertension and stage 1 hypertension without any pre medication cardiac therapy were selected. They underwent 6 weeks of aerobic exercise training program. The aerobic exercise program consisted of repetitive, low resistance movements for at least 30 to 45 min, at 50% to 70% of Max heart rate, 3 to 4 times per week. The systolic & diastolic blood pressure were measured at baseline and after 6 weeks of aerobic exercises training program using sphygmomanometer[10,13] and pulse rate was measured by manual method.* ***Results:*** *The result of present study demonstrated a significant difference between group effects in both the Systolic and Diastolic Blood Pressure. It was found that there was significant difference in the mean systolic blood pressure and diastolic blood pressure values for pre and stage hypertensive subjects.* ***Conclusions:*** *In conclusion, the inclusion of Aerobic exercise in daily activities is an efficient way of blunting the blood pressure changes in hypertensive patients and it is of high statistical significance ($p<0.005$). The above mentioned efficiency is more on Stage 1 hypertensive subjects when compared to pre hypertensive subjects.*

Keywords: Hypertension, Aerobic Exercise,

ملخص: الوقاية والعلاج من ارتفاع ضغط الدم من أولويات الطب والصحة العامة. من المؤكد أن خفض ضغط الدم بالأدوية يقلل بشكل ملحوظ من المخاطر القلبية الوعائية. ممارسة الرياضة لا تزال تمثل حجر الزاوية في الوقاية الأولية، والسيطرة والعلاج على ارتفاع ضغط الدم. تهدف هذه الدراسة إلى تحليل أثر التمارين الهوائية على خفض ضغط الدم في مرحلة ما قبل ظهور ارتفاع ضغط الدم و ارتفاع ضغط الدم في المرحلة الاولي. **منهج الدراسة**: تم اختيار مرضي ضغط الدم في مرحلة ما قبل ظهور ارتفاع ضغط الدم ومرحلة ارتفاع ضغط الدم البسيط وغير خاضعين لأي علاج. أخضعوا لبرنامج رياضي لمدة 6 أسابيع . يتألف البرنامج من التمارين الرياضية المتكررة بحركات المقاومة المنخفضة لمدة لا تقل 30 حتي 45 دقيقة، بنسبة 50٪ إلى 70٪ من معدل ضربات القلب, 3 إلى 4 مرات في الأسبوع. تم قياس ضغط الدم الانقباضي والانبساطي قبل البرنامج وبعد 6 أسابيع من التمارين الهوائية كما تم قياس معدل النبض. **النتائج**: أظهرت نتيجة الدراسة فرقا كبيرا ذو دلالة احصائية ($p<0.005$) في ضغط الدم قبل وبعد التمارين الاستنتاجات: إدراج التمارين الرياضية في الأنشطة اليومية هو وسيلة فعالة لخفض ضغط الدم, وتظهر الفعالية اكثر على ارتفاع ضغط الدم في المرحلة الاولي بالمقارنة مع مرحلة ما قبل ارتفاع ضغط الدم.

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Correspondence: shaphe72@yahoo.com
[1]Associate Professor, Physical Therapy, College of Applied Medical Sciences, Jezan University, Saudi Arabia; [2]Lecturer, Physical Therapy, College of Applied Medical Sciences, Abha University, Saudi Arabia; [3]Lecturer, Physical Therapy, College of Applied Medical Sciences, Majmaah University, Saudi Arabia; [4]Lecturer, Physical Therapy, College of Applied Medical Sciences, Jezan University, Saudi Arabia

INTRODUCTION

Hypertension generally defined as blood pressure persistently above 140/90 mm Hg and is extremely common. Even mild blood pressure elevations are associated with an increased risk of myocardial infarction and stroke, and the risk rises continuously with the severity of the condition[1]. Individuals who have blood pressure that is more than 160/95 mm Hg have an annual incidence of coronary artery disease (CAD), congestive heart failure, intermittent claudication, and stroke that is up to three times higher than normotensive persons[2].They also have an exercise capacity about 30% less[3].

Consequently, the prevention and treatment of hypertension are a high priority in medicine and public health. It is well documented that blood pressure reduction with medication significantly reduces cardiovascular risk. But nonpharmacologic strategies for blood pressure reduction, including weight loss, dietary modification, and exercise, are also effective. Particularly when patients have mild to moderate hypertension, these strategies offer the possibility of reducing blood pressure and cardiovascular risk without any of the adverse side effects associated with medication.

Exercise remains a cornerstone therapy for the primary prevention, treatment, and control of hypertension. Exercise programs that primarily involve endurance activity prevent the development of hypertension and lower blood pressure (blood pressure) in adults with normal blood pressure and those with hypertension[4].

With direct effects on circulation, metabolism, and the nervous system, exercise represents a multipronged assault on cardiovascular risk. Whether used only with other lifestyle changes or in combination with medication, exercise is a particularly attractive tool for hypertension control. Many studies[5] have validated exercise for treating high blood pressure. Exercise not only reduces blood pressure, it also lowers levels of low-density lipoprotein cholesterol, reduces insulin resistance and glucose intolerance, and often is associated with reduced body weight[6].

Influence of gender and weight. There was no significant correlation between weight change and blood pressure reduction. Comparable effects have been seen in adolescents, individuals over 60, and those in between[7].

Generally, it appears that training in the range of 40% to 70% of VO2 max(50% to 70% of maximum heart rate) was as effective as, if not more effective than, a more intense regimen. Blood pressure reductions typically appeared within 3 months of the start of training. Generally, no further blood pressure reduction occurs after 3 months of training, except in rare instances[8]. The program should be at least 1 to 3 months to reach the stable stage, and training should be maintained indefinitely, because the hypotensive effect persists only as long as regular endurance exercise is maintained.

The basic exercise prescription for all groups is similar to that recommended by the ACSM[9] to develop and maintain cardiovascular and muscular fitness in healthy adults: at least a half-hour of endurance exercise at 50% to 75% of maximal oxygen uptake (50% to 70% of maximum heart rate) done at least 3 days a week. Physical activity of moderate intensity involving rhythmic movements with the lower limbs for 50–60 minutes, 3 or 4 times per week reduces blood pressure and appears to be more effective than vigorous exercise[10].

The type of aerobic exercise is largely a matter of patient preference. Walking at a 15-minute/mile pace is ideal for many; it

requires no equipment or special clothing and fits readily into most patients' schedules. Some prefer jogging, biking, or swimming. Exercise machines such as treadmills, stationary cycles, or cross-country ski devices provide an effective workout for individuals who enjoy exercising at home, health club or gym.

The rationale for treating hypertension is the reduction of cardiovascular morbidity and mortality. It is important to note that aerobic exercise has a positive effect on other cardiovascular risk factors, such as blood lipid levels, body weight, and insulin resistance. Overall, more than 40 clinical studies suggest an inverse relationship between physical activity and the incidence of coronary artery disease. With appropriate screening and individualized exercise prescription, regular physical activity can and should be incorporated into the life-style of an individual. Increases in activity among sedentary persons have the potential to bring major benefits in functional capacity, a sense of well-being and other health outcomes[10].

Drug therapy has for long been the mainstay management of hypertension. The commonly used drugs causes adverse effects like bradycardia, bronchospasm, fatigue, deterioration of renal function, adverse metabolic effects like increased serum cholesterol and reduction in HDL cholesterol. Reduction in blood pressure via regular aerobic exercise reduces cost and medication related side effects.

This study aims at analysing the effect of Aerobic exercises on reduction of Blood Pressure in the subject with Pre and Stage 1 hypertension.

METHODOLOGY

In this study patient with pre hypertension and stage 1 hypertension without any pre medication cardiac therapy were selected. They underwent a 6 weeks aerobic exercise program.

After explaining the procedure an informed consent was obtained from all the patients. Prescribed aerobic exercises were given after a brief warm up and the exercise program ends with cool down exercises. The aerobic exercise program consisted of repetitive, low resistance movements for at least 30 to 45 min, at 50% to 70% of Max heart rate, 3 to 4 times per week. The systolic & diastolic blood pressure were measured at baseline and after 6 weeks of aerobic exercises training program using sphygmomanometer[10-13] and pulse rate was measured by manual method.

All the patients were requested to attend the experimental set up daily for the first 2 weeks regularly to participate in the exercise program[14]. Each patient is given the value of their target heart rate and instructed to rest a while if the pulse rate reaches the target heart rate. Once the patients were trained they were asked to continue the program for the remaining 4 weeks at their residence. Patients were taught to measure pulse rate and asked to record their pulse rate and discomfort if any. The blood pressure measurements before and after 6 weeks of exercise program was statistically analysed using descriptive and inferential statistics.

RESULTS

In this study 40 subjects with a mean age of 42.52±5.29 ranging from 35 to 51 years, mean systolic pressure of 147.87 ± 12.52 and mean diastolic pressure 89.8 ± 4.81 were taken. Required statistical test were performed to find out the effect of experiment on the dependent variables, these findings are mentioned below.

Table 1: Effect of aerobic exercises on systolic blood pressure

		Group A *M ± SD* *(n=20)*	*Group B* *M ± SD* *(n=20)*	*Paired t-test*	
				T	P
Pre SBP1		137 ± 1.78	158.75 ± 8.32	-11.43	0.001*
Post SBP45		134.3 ± 2.18	137.75 ± 6.04	-2.41	0.021*
Independent T-test	t	11.711	22.74		
	p	0.001*	0.001*		

Table 2: Effect of aerobic exercises on diastolic blood pressure

		Group A *M ± SD* *(n=20)*	*Group B* *M ± SD* *(n=20)*	**Paired t-test**	
				T	P
Pre DBP1		85.3 ± 2.04	94.25 ± 2.65	-11.9	0.001*
Post DBP45		83.2 ± 1.89	88.1 ± 2.17	-2.17	0.001*
Independent T-test	t	10.3	16.2		
	p	0.001*	0.001*		

Keys: Group A: Pre-hypertensive Subjects, Group B: Stage I hypertensive subjects, SBP- Systolic Blood Pressure, DBP- Diastolic Blood Pressure, 1- Baseline reading, 45- After 45 day of aerobic exercise training.

The result of present study demonstrated a significant difference between group effects in both the Systolic and Diastolic Blood Pressure (Table 1). To look for the difference between the baseline readings taken on the first day of the study with the post-test readings of systolic blood pressure on the 45th day an independent t-test was performed which showed a significant difference in both group A as well as in group B (Table 2). It was found that the systolic blood pressure decreased 3 mm/hg which was found significant (t=11.71, p<=0.001). A similar decrease of 21 mm/hg in group B was seen which was significant (t=22.74, p<=0.001).

From the analysis of systolic blood pressure and diastolic blood pressure changes after exercise, it was found that there was significant difference in the mean systolic blood pressure and diastolic blood pressure values for pre and stage hypertensive subjects. The objective of this study was to compare the mean difference in systolic blood pressure and diastolic blood pressure for group A and group B subjects to evaluate the effect of aerobic exercise on hypertension. When we analyse the response of group A and group B subjects. It was found that mean systolic blood pressure of 137mmhg (group a) and 158.75mmhg (group b) seen pre-test was reduced to 134.35 (group a) and 137.75 (group b) post-test. Also it was found that mean diastolic blood pressure of 85.35 (group a) and 94.25 (group b) seen pre-test was decreased to 85 (group a) and 88.1(group b) post-test.

DISCUSSION

The physiological basis for this reduction in blood pressure values is that the aerobic endurance training decreases blood pressure through a reduction of vascular resistance,

in which the sympathetic nervous system and the renin-angiotensin system appear to be involved, and favourably affects concomitant cardiovascular risk factors[15-18].

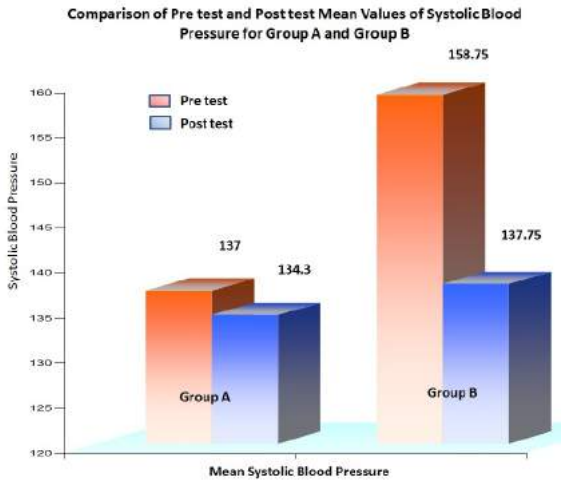


Fig. 1: Comparison of 1st and 45th day's Systolic BP between pre & stage 1 hypertensive patients.

Our results are similar to the study conducted by A Kiyonaga et al (1985)[1] to evaluate the effect of Blood pressure and hormonal responses to aerobic exercise. They selected twelve patients with essential Hypertension (WHO stages I-II) were subjected to mild aerobic exercises for 10 to 20 weeks. A reduction in SBP/DBP (mean) blood pressures by more than 20/10 (13) mm Hg was seen in 50% of patients after 10 weeks and in 78% after 20 weeks of exercise. The results indicate that exercise therapy is a potent non pharmacological tool for the treatment of essential hypertension, especially of the low rennin type. When we analyse the mean difference values of systolic blood pressure and diastolic blood pressure in group A and group B subjects, the results shows that there is a significant difference ($p<0.005$) in the values of systolic blood pressure and diastolic blood pressure. The result shows that the aerobic exercise plays an important role in reducing the blood pressure changes associated with hypertension [19-20].

The results of this study accord with the findings of most recent studies that show moderate intensity aerobic exercise training can lower blood pressure in patients with stage 1 and 2 essential hypertension. The average reduction in blood pressure is 10, 5 mm Hg for systolic and 7, 6 mm Hg for diastolic blood pressure and these reductions do not appear to be gender or age specific [21-24].

The next objective of this study was to compare the role of aerobic exercise on systolic blood pressure and diastolic blood pressure between pre hypertensive (group A) and stage 1 hypertensive (group B) subjects. When we analyze the results it was found that there was significant difference ($p<0.005$) in the values of systolic blood pressure and diastolic blood pressure between group A and group B subjects. Result shows that patients with stage 1 hypertension showed much change in the systolic blood pressure and diastolic blood pressure values when compared with the pre hypertensive subjects [25-26].

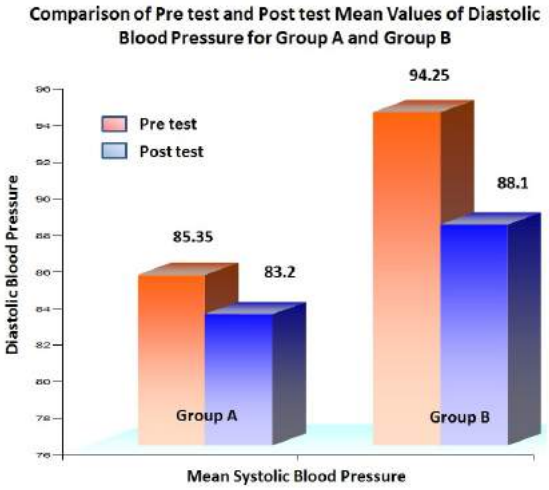


Fig. 2: Comparison of 1st and 45th day's Diastolic BP between pre & stage 1 hypertensive patients.

The results take a strong support from Karen T. Lesniak et al (2001)[27] Hypertensive subjects appear to experience greater reductions than normotensive subjects. Exercise interventions may be

safely and effectively used with mild to moderate as well as severe levels of hypertension. Through this present study it is clear that aerobic exercise plays a major role in the control of hypertension and these beneficial effects are found more in stage 1 hypertensive subjects when compared to pre hypertensive patients [28].

CONCLUSION

In conclusion, the inclusion of Aerobic exercise in daily activities is an efficient way of blunting the blood pressure changes in hypertensive patients and it is of high statistical significance ($p<0.005$). The above mentioned efficiency is more on Stage 1 hypertensive subjects when compared to pre hypertensive subjects.

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